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ABSTRACT

Two years after the introduction of CD-ROM bibliographic database searching in the Memphis State University libraries (Tennessee), a survey was conducted to examine students' attitudes toward the business database, ABI/INFORM. ABI/INFORM contains indexes and abstracts of articles from over 800 journals on management, accounting, banking, human resources, marketing, and other areas of business. Each compact disk contains bibliographic citations from the last 5 years. An 11-item Likert-type questionnaire was distributed randomly to 180 students in the spring and summer of 1990. A factor analysis was used to analyze the 119 usable surveys that were returned. Three underlying dimensions or factors of students' attitudes were found: (1) perceived costs and benefits; (2) reference service and instruction; and (3) availability of CD-ROM workstations. The findings and implications of the survey are discussed. Factor analysis, conducted with a statistical programming package, facilitates analysis of the relationships among the variables. Three tables present student attitude findings, and an appendix contains the questionnaire. (SLD)

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STUDENTS' ATTITUDES TOWARD ABI/INFORM ON CD-ROM: A FACTOR ANALYSIS

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ABSTRACT

Two years after introducing CD-ROM bibliographic database searching in the Reference Department of Memphis State University Libraries, a survey was conducted to examine students' attitudes toward the business database, ABI/INFORM. Factor analysis was employed to analyze the data. Three underlying dimensions or factors of students' attitudes were found: "perceived costs/benefits," "reference service and instruction" and "availability of CD-ROM workstations." The findings and implications of the survey are discussed.

BACKGROUND

Since the introduction of CD-ROM bibliographic database products into the library world in early 1985,[1] more and more libraries have added this technology to their service profiles. Its growing popularity has led to dramatic changes in planning, budgeting, staffing and training in almost every type of library, as reflected in the proliferation of CD-ROM-oriented articles in the library literature in recent years.[2]

To enhance information access to its patrons, the Reference Department of Memphis State University (MSU) Libraries set up the Information Retrieval Center for CD-ROM searching in 1988. Based on the statistics obtained from the Department's online information retrieval service (BRS and Dialog) and the end-user service, U-SEARCH (i.e. BRS AFTER/DARK), 5 heavily searched databases were selected for subscription. They were: ERIC, PsycLIT, ABI/INFORM, Dissertation Abstracts and Medline. A total of 10 workstations were set up to provide the new service.[3]

The Information Retrieval Center is located in a corner of the Reference Department, close to the reference desk for easy monitoring. Each of the workstations is equipped with a CD-ROM drive, an IBM compatible microcomputer with monitor and keyboard, and a printer. Acoustic panels are installed as partitions between the workstations to provide some degree of privacy and to reduce

noise levels and distractions.

The introduction of CD-ROM bibliographic databases as a new, free public resource in MSU Libraries is well received by faculty and students. To meet the growing demand of its use, patrons are encouraged to sign-up at the reference desk, reserving time up to a week in advance. A 30-minute time-slot for searching is allowed. Sign-ups for two consecutive time-slots are not accepted but patrons may continue searching if no one has scheduled the succeeding time. Downloading of bibliographic records onto a floppy disk is encouraged. In-house designed flip-charts were developed to provide instructions for searching, printing and downloading. Hands-on assistance is also available from the reference staff.

OBJECTIVES

Two years after introducing the CD-ROM bibliographic database searching in MSU Libraries, one of the most heavily used databases, ABI/INFORM was selected for this initial study. ABI/INFORM, produced by University Microfilms International, contains indexes and abstracts of articles from over 800 journals on management, accounting, banking, human resources, marketing, and other areas in the field of business. Each compact disk contains bibliographic citations from the last 5 years. The database was updated bimonthly at the time of this study. Since the fall of 1990 it is updated on a monthly basis. The objectives of this initial study are:

-to explore the independent underlying dimensions of students' attitudes toward ABI/INFORM on CD-ROM;

-to illustrate the application of factor analysis as a useful research technique in studying attitudinal issues in library and information science.

FACTOR ANALYSIS

Factor analysis is a multivariate statistical technique for synthesizing a large amount of survey data. The data contains responses to the variable items stated in a questionnaire. Through multiple correlations, the larger sets of variable items can be narrowed down to a manageable subset of groups or factors in a systematic manner for substantial interpretation. Each factor can then be considered as a dimension which reveals the underlying relationships among variables that had not been discovered previously.

Factor analysis has long been employed by social scientists and educators in identifying the underlying dimensions of temperament, interests, and attitudes among various subjects[4]. It could also be well applied in interpreting library survey data[5]. This study illustrates the application of factor analysis as a useful technique to measure users' attitude toward information retrieval on a CD-ROM bibliographic database.

METHODOLOGY

A questionnaire with 11 Likert-type statements was structured to elicit respondents' attitudes toward the CD-ROM version of ABI/INFORM. Respondents were asked to indicate the level of their agreement/disagreement on a 5-point scale, ranging from strongly agree (1) to strongly disagree (5). (The questionnaire is included in the Appendix).

Copies of the questionnaire were distributed randomly at the site of ABI/INFORM workstations during regular library hours. A total of 180 copies were distributed during a 4-week period in the spring semester and the first summer semester of 1990. Among the 130 returned copies, 119 copies were usable. The data were analyzed using the statistical package SPSS-X.

It is assumed that those variables loaded strongly on a particular factor are actually measuring a broader underlying dimension. Correlations among the 11 variables are computed. Variables highly correlated with each other are grouped together. Those in the same group are assumed to measure the same factor. Then the correlation between each variable and each respective factor is computed, and a factor-analytic solution is generated in the form of a factor-loading matrix as presented in Table 1. (insert Table 1) Each factor loading reflects the correlation between a variable and a factor. Although each variable can load on

to be correlated with more than one factor, only the one with the highest loading is considered to be significant. At this point, significant loadings for each variable will be underlined and assessed.

The next procedure of factor analysis is followed by factor rotation. Factor rotation is used to facilitate the interpretation of factors associated with the highest loading variables[6]. Through varimax rotation, a type of factor rotation, each variable will only load on one particular factor. This allows us to assume not only that each factor is unidimensional, but also that it is completely independent of the other factors that are constructed simultaneously[7].

The rotated factor loadings are forced to be near 0 or 1 (see Table 2). (insert Table 2) They give information on how strongly each variable is correlated with each dimension. The closer the factor loading is to 1, the more confidently the researcher can generalize from the variable to that factor.

FINDINGS

The result of the factor analysis with varimax rotation yielded a 3-factor solution, as presented in Table 3. (Insert Table 3) There are 6 variables loading strongly on the first factor which

include "willing to wait for the next available CD-ROM if all are busy" (.41), "CD-ROM does not cost anything" (.58), "takes less time to search on CD-ROMs" (.81), "search terms or concepts more flexible on CD-ROMs" (.76), "more helpful to get a printout from the CD-ROM search result" (.72), and "information on CD-ROMs is not as updated as printed indexes" (.53). They reveal users' perception on the costs/benefits of CD-ROM searching. Thus the first factor is labeled as "Perceived Costs/Benefits."

Three other variables load strongly on the second factor. They are: "reference personnel are available to help with problems in searching on CD-ROMs" (.90), "reference personnel have enough knowledge to help use CD-ROMs" (.86), and "reference personnel supply the printing paper right away when it is out" (.58). Obviously reference services account for the underlying dimensionality of factor 2. These services include the availability and knowledge of the reference staff in assisting users to overcome various problems or difficulties while they are searching the database. Thus the second factor is labeled as "Reference Service and Instruction."

Two variables load strongly on the third factor. They are: "users wait for 30 minutes or more to get on the CD-ROM" (.80); "more CD-ROM computers need to be available" (.64). These 2 variables reflect the demand of CD-ROM workstations by users. Even though the responding students would wait for 30 minutes or more to search the

database, they want more CD-ROM workstations to be available to shorten their waiting time period. Hence the third factor is labeled as "Availability of CD-ROM workstations."

Once again, it should be emphasized that each of the 3 factors groups variables according to the empirical relationships of the survey data. The researchers did not create the factors but rather interpret the factors that emerge from the data[8]. Generally, the factor which captures a larger amount of variance for data explanation is placed in a higher priority than the others. Thus the result of this study shows that factor 1 has extracted more information than the other 2. Factor 1 has explained 27% of the variance, followed by 16% and 13% of factors 2 and 3, respectively.

The validity of the information captured by each factor can be indicated by eigenvalues. The criterion for the eigenvalue associated with each factor holds that it needs to be greater than 1 if the factor is considered to be useful to explain the variance of the variables. Evidently, as revealed from Table 3, the eigenvalue of each of the 3 factors exceeds 1: Factor 1 (2.99743), Factor 2 (1.79362), and Factor 3 (1.43056). Overall, more than 56% of the total variance explained the attitudinal variables of the 3 factors. The other 44% of the variance was not accounted for by the 3-factor solution because it is "unique variance," which can only be captured by the individual variables[9].

Lastly, reliability analysis, which is often used in conjunction with factor analysis, is performed to test the degree of internal consistency among the items loading on a given factor[10]. The result is presented in Table 3. It is found that the alpha reliability coefficients are: Factor 1 (.7071), Factor 2 (.7023), and Factor 3 (.4736). The first 2 coefficients are much higher than the last one. Generally, a higher coefficient indicates greater consistency of the contribution of the variable items in measuring the underlying dimension. Hence the variable items of Factors 1 and 2 are more consistent than the variable items of Factor 3 in the measurement.

IMPLICATIONS AND DISCUSSIONS

The results of this study suggest that MSU students' attitudes toward the CD-ROM bibliographic database can be analyzed and interpreted from the constructs of the 3 dimensions or factors. The implications of each are discussed as follows:

1) Perceived Costs/Benefits:

Before ABI/INFORM was available at MSU, some of the printed resources used by the business school's students were Business Periodicals Index, Wall Street Journal Index, and Predicasts F&S Index. With the availability of ABI/INFORM on CD-ROM, students would generally search electronically rather than manually. The

electronic database provides a more flexible and efficient means for the students to fulfill their needs in academic work while the printed indexes do not. They can now search a bibliographic citation on screen without flipping through hundreds of pages of printed indexes. In addition, students can combine terms to perform a more specific or broader search. Such options are not available in the use of printed indexes. They do not have to copy the bibliographic information on a piece of paper because they can simply get a print-out of search results without charge.

Although there is no equivalent printed index to ABI/INFORM (updated bimonthly at the time of the study), many students regard Business Periodicals Index (updated monthly) as a comparable resource to ABI/INFORM. They are willing to forgo the currency of Business Periodicals Index for the perceived benefits of ABI/INFORM: relative ease and convenience of use, fast retrieval and free print-out.

Even though CD-ROM services in many libraries are provided on a no-charge basis, it is indeed an expensive service to the libraries as there are costs allocated in such areas as subscription fees, equipment, overhead, and staff time. Nevertheless, its unique features and growing popularity among users will help to justify the costs to the library. Moreover, the heavier its usage is, the lower its per unit cost of searching is to the library.

2) Service and Instruction from Reference Staff

The implementation and success of CD-ROM bibliographic database service in the Reference Department imposes additional demands on the services provided by the reference staff. In addition to their regular reference desk duties, reference staff must be trained to assist patrons in searching, printing, downloading, loading paper, changing ribbons, or rebooting the systems when minor systems problems or occasional searching failures occur. Assisting patrons in using the CD-ROM bibliographic database is just as crucial as any other reference services demanded on the librarians. An adequate number of well-trained reference personnel is essential to maintain the quality of service. The Reference Department and library administration need to pay more attention to planning, staff training, staff scheduling of reference desk duties, and updating the in-house self-instruction guides for searching the CD-ROMs. Libraries that are considering the installation or maintaining the quality of CD-ROM service must take these elements into account.

3) Availability of CD-ROM Workstations

The study indicates that students show great concern about the availability of CD-ROM workstations for searching the ABI/INFORM database. During the course of the semester, students usually have

to wait for 30 minutes or more to use the database, if they have not made reservations in advance. There is a strong need for more workstations to maximize the utility of this new service. It is expected that the demand for access to CD-ROM databases will continue to increase as more library users are aware of this new service.

Would the addition of more single-user workstations be sufficient to satisfy the growing needs of CD-ROM users? Alternatives such as providing multi-user access to CD-ROM searching or other forms of electronic information retrieval should also be considered by the library administrators. Within the constraints of finite budgets in most libraries, a feasibility study may be conducted to examine the strengths and weaknesses of the alternative options before a final decision is reached.

CONCLUSION

The use of factor analysis in this study leads to several readily apparent conclusions. As a viable statistical technique, factor analysis generated 3 underlying dimensions of users' attitudes toward the ABI/INFORM database. These are: "perceived costs/benefits," "service and instruction from reference staff," and "availability of CD-ROM workstations." Overall, students at MSU respond favorably to the addition of CD-ROM bibliographic database as a new reference resource.

Factor analysis provides an efficient means in interpreting results of library surveys because of its strength in synthesizing large amounts of data. The inclusion of factor analysis programs in many statistical programming packages makes this technique fairly easy to use[11]. It facilitates the analysis of the underlying relationships among the variables within the framework of the derived dimensions. This kind of study could be extended to other attitudinal or user-behavioral issues in library and information science.

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Information Science Research 12, no. 2 (April-June, 1990): 131-153.

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10. Marshall, "The Perceived Complexity," p. 92.

11. Bailey, Methods of Social Research, p. 369.

TABLE 1. UNROTATED FACTOR MATRIX

Variable item numbers*	Factor 1	Factor 2	Factor 3
1	.54339	.07955	-.17076
2	.45694	-.35719	.15914
3	.68211	-.45539	-.08091
4	.70093	-.32926	-.15766
5	.74111	-.16748	.07119
6	.42699	-.26780	.48252
7	.51000	.69178	.27848
8	.48161	.64666	.31351
9	-.10062	-.21996	.77196
10	.33038	.54590	-.11750
11	-.44031	-.06968	.56674

* Refer to the Appendix for the descriptions of each variable item.

N.B. Significant loadings on each variable item are underlined.

TABLE 2. VARIMAX ROTATED FACTOR MATRIX

Variable Item Numbers	Factor 1	Factor 2	Factor 3
1	**.40819**	.28621	-.28675
2	**.58278**	-.02302	.13308
3	**.81273**	-.06357	-.12096
4	**.75747**	.02907	-.22353
5	**.72137**	.24506	-.04408
6	**.53416**	.11998	.43261
7	.08727	**.89876**	.02876
8	.08914	**.85705**	.07698
9	.08013	-.02073	**.80473**
10	-.01410	**.58180**	-.28685
11	-.30032	-.11935	**.64458**

TABLE 3. SUMMARY OF A FACTOR ANALYSIS OF STUDENTS' ATTITUDES TOWARD CD-ROMs

Factor Names & the High Loading Variables	Factor Loadings
Factor 1: Perceived Costs/Benefits	
1. If all the CD-ROMs for ABI/INFORM are busy, I am willing to wait for the next available one.	.40819
2. Searching ABI/INFORM on CD-ROMs does not cost me me anything.	.58278
3. Searching ABI/INFORM on CD-ROMs takes less time than on printed indexes.	.81273
4. CD-ROMs allow me to search terms or concepts more flexible than printed indexes.	.75747
5. To get a printout from my search results on CD-ROMs is more helpful than using the printed indexes.	.72137
6. The information on CD-ROM is not as updated as those in printed indexes.	.53416
Factor 2: Reference Service and Instruction	
7. Reference librarians and staff are available when I have problems in searching the ABI/INFORM on CD-ROMs.	.89876
8. Reference librarians and staff have enough knowledge or training to help me go through with the usage of CD-ROMs.	.85705
10. The printing paper on CD-ROMs is added right away by reference staff when it is out.	.58180
Factor 3: Availability of CD-ROM Workstations	
9. I have to wait at least 30 minutes to get on the the ABI/INFORM database.	.80473
11. More CD-ROM computers need to be available.	.64458

	Factor 1	Factor 2	Factor 3
Eigenvalue	2.99743	1.79362	1.43056
Percent of Variance	27.3	16.3	13.0
Cumulative % of Variance	27.3	43.6	56.6
Alpha Reliability	.7071	.7023	.4736

APPENDIX

Please indicate your level of agreement with the following statements regarding CD-ROM. Circle the number which most closely correspond to your opinion.

SA = strongly agree
A = agree
U = undecided
D = disagree
SD = strongly disagree

	SA	A	N	D	SD
1. If all the CD-ROMs machines for ABI/INFORM data base are occupied, I am willing to wait for the next available one.	1	2	3	4	5
2. Searching ABI/INFORM on CD-ROMs does not cost me anything.	1	2	3	4	5
3. Searching ABI/INFORM on CD-ROMs takes less time than on printed indexes.	1	2	3	4	5
4. CD-ROMs allows me to search terms or concepts more flexible than printed indexes.	1	2	3	4	5
5. To get a printout from my search results on CD-ROMs is more helpful than using the printed indexes.	1	2	3	4	5
6. The information on CD-ROMs is not as updated as those in printed indexes.	1	2	3	4	5
7. Reference librarians and staff are available when I have problems in searching the ABI/ INFORM on CD-ROMs.	1	2	3	4	5
8. Reference librarians and staff have enough knowledge or training to help me go through with the usage of CD-ROMs.	1	2	3	4	5
9. I have to wait at least 30 minutes to get on the ABI/INFORM of CD-ROM computers.	1	2	3	4	5
10. The printing paper on CD-ROMs is added right away by library staff when it is out.	1	2	3	4	5
11. More CD-ROM computers need to be available.	1	2	3	4	5